annealed and the segment being adapted by the presence of said pattern to be joined in a step-lap joint in said segmented transformer core.

REMARKS

For the sake of clarity claims 1 and 28 (and claims 4, 6, 7, 14-18, and 20-25 and 29-36 dependent thereon, respectively) have been amended. Each of the amendments is clearly supported by the original specification; particularly at page 4, line 29 through page 5, line 7; page 5, line 28 through page 6, line 4; page 8, lines 6 through 16; and Figs. 4-11 of the drawings. Consequently, no new matter has been added by these amendments.

Applicants' invention as recited by present claims 1, 4, 6, 7, 14-18, 20-25, and 28-36 discloses a transformer core and segments for the construction thereof. Generally stated, each of the segments comprises a plurality of packets, and each of the packets comprises a pre-determined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern. The segments are formed and then annealed, and the core is subsequently assembled from the formed and annealed segments.

Significant advantages in manufacture and operation are afforded by use of the core segments for constructing the transformer core, as recited by applicants' amended claims 1, 4, 7, 14-18, 20-25, and 28-36. More specifically, applicants' segmented transformer core overcomes substantial problems encountered in the practice of prior art methods, especially methods directed to wound core transformer construction. Very significantly, cores having the structure recited by applicants' amended claims can be manufactured in a commercially viable manner for use in transformers having a size rating far larger than those made with alternative structures. As set forth in the specification at page 6, lines 21-24, and in present claim 36, the sizes of segmented amorphous metal transformer cores defined by present claims 1, 4, 7, 14-18, 20-25 and 28-36 can advantageously be as large as 500 MVA. Wound core amorphous metal cores having high

efficiency and power ratings of 10-100 kVA or more are commonly available. While those cores have been used in distribution transformers for residential and light commercial service, the manufacture of much larger devices has been a formidable challenge. Notwithstanding the significant benefits derived from the prospect of comparable improvements and energy savings in these large devices, manufacturers have heretofore been unable to build large transformers in a commercially viable manner using known methods and structures. Stacked core methods that allow construction of large, conventional transformers incorporating silicon steel have proved to be impractical when replicated with amorphous metal. Significant problems attributed in part to the thin gage (typically 20-25 µm) and notoriously brittle nature of amorphous metal make it difficult to handle, especially in the annealed condition. As previously noted, wound core methods that promote handling, supporting, and annealing of entire cores cannot be scaled to make the larger core sizes required for industrial power ratings (ranging up to 500 MVA). Cores for power ratings much larger than 1 MVA necessarily weigh many hundreds of kilograms. The issues of handling, supporting, and annealing entire cores are quite formidable. Accordingly, the advantages of high efficiency and low core loss previously obtained with small sized core containing devices that incorporate amorphous metal have remained elusive in transformers with rated capacity sufficiently large for heavy industrial and substation use. By way of contrast, the transformer core defined by applicants' claims 1, 4, 7, 14-18, 20-25, and 28-36 represents a highly significant advance in the art – a low core loss transformer that is efficiently manufactured in sizes heretofore considered to be inaccessible. The segmentation of the core called for by applicants' claims allows use of much simpler processing equipment. Cutting, forming, assembling, and annealing of each segment is accomplished much more easily than if a more massive core were to be processed as an entire unit at each stage of manufacture. When compared to wound cores made by conventional assembly methods, the cores delineated by applicants' claims exhibit lower internal stress, especially at the core corners. Annealing

efficiencies are improved, since heat treatment schedules may be optimized to account for variation in heatup and cooldown times, as well as oven loading for segments whose sizes and shapes are substantially different. Material utilization is enhanced, and process yields are increased. Failures and material breakage inherently produced by the time consuming steps involved when repeatedly lacing and unlacing the cores during wound core construction are virtually eliminated. Significantly larger cores can be constructed at lower cost in a much more efficient, reliable manner.

Claims 1, 4, 6, 7, 14-18, 20-25, and 28-36 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctively claim the subject matter which applicants regard as the invention. The Examiner has indicated that claim 1 is unclear as to whether annealing takes place prior to assembly, and as to what is intended by "individually annealed" and "step-lap joint portion." Claims 4, 6, 7, 14-18, and 20-25 were rejected as depending from and thereby containing the defects of claim 1.

Claim 1 has been amended to recite a transformer core comprising a plurality of segments, each of which comprises of a plurality of packets. The packets each comprise a predetermined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern. The segments are formed and <u>then</u> annealed and the core is <u>subsequently</u> assembled from the annealed segments. Applicants respectfully submit that, as amended, claim 1 clearly brings out that the annealing takes place prior to assembly. The recitation that each segment of the core is formed and subsequently annealed prior to being assembled with one or more other segments to form the core is clearly supported by page 6, line 30 through page 8, line 31 of the original specification.

As set forth in the specification at page 3, lines 29-30; page 7, line 29 through page 8, line 1; and in Fig. 3, a step-lap joint region is present at the ends of each packet used to construct each segment of the transformer core recited by amended claim 1. The step-lap pattern is established by staggering and indexing each group of cut amorphous metal strips relative to the groups adjacent thereto. The assembly of plural segments during formation of the core defined by amended claim 1

creates a plurality of step-lap joints. Each of the joints joins two segments, one of which forms an overlap and the other forms an underlap. The relationship extant at each of the joints is shown by Figs. 9-11 and, in greater detail, by Fig. 8. Applicants respectfully submit that Figs. 9-11 of the drawings, when read in light of the specification, particularly at page 5, lines 17-22, provide adequate support for the term "step-lap joint pattern" in claim 1, as amended.

In regard to claim 28, the Examiner has indicated that (i) the specific annealing of the core segment requires clarification, (ii) the phrase "adapted to" is unclear, since an element "adapted to" perform a function is not a positive limitation, (iii) the phrases "at least one further mating transformer core segment" and "said transformer core segment" lack antecedent basis, and (iv) the transformer core in line 2 is not clearly indicated. Claims 19-36 were rejected as depending from and thereby containing the defects of claim 1.

Claim 28 has been amended to recite a transformer core segment for use in a segmented transformer core having a plurality of segments. The claimed transformer core segment comprises a plurality of packets, each comprising a pre-determined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern. The segment is formed and then annealed. The presence of the step lap joint pattern enables the claimed segment to be joined to another such segment having a mating step-lap joint pattern. It is respectfully submitted that claim 28, as amended, clearly brings out that annealing takes place prior to assembly. That is to say, each annealed segment is appointed for subsequent assembly to form a finished, segmented transformer core. It is also submitted that incorporation of the phrase "segmented transformer core" in the preamble of amended claim 28 provides antecedent basis for use of that phrase in the last line of the claim.

Applicants further submit that the phrase "adapted by the presence of said pattern to be joined in a step-lap joint", as used in amended claim 28, is a positive limitation. Clearly, that phrase requires the step-lap pattern in the claimed segment to have dimension and structure that enables its joinder with a mating structure present on another segment. In addition, the phrase distinguishes the

claimed segment from other segments that lack such structure and, as a result, are structurally incapable of interoperability with other segments in the construction of the segmented core defined by present claim 1. For these reasons, it is submitted, the phrase "adapted by the presence of said pattern to be joined in a step-lap joint" provides basis upon which the patentability of amended claim 28 may be properly predicated. <u>In re</u> Venezia, 530 F.2d 956, 189 USPQ (C.C.P.A. 1976) 149-152.

In view of the amendments to claims 1 and 28, and the foregoing remarks, it is submitted that the rejection of claims 1 and 28 (as well as claims 4, 6, 7, 14-18, and 20-25 and 29-36 dependent thereon, respectively) under 35 U.S.C. 112, second paragraph, as being indefinite has been obviated; reconsideration thereof is respectfully requested.

Claims 1 and 28 were rejected under 35 U.S.C. 102(b) as being unpatentable over U. S. Patent 4,364,020 to Lin et al.

Lin et al. disclose a magnetic core for use with electrical windings. The core is characterized by a plurality of groups of butt-jointed laminations of high permeability, amorphous material with each lamination group having a layer of protective material surrounding the outermost lamination. The protective layer comprises a strip of material having a melting point above the temperature range of from about 340°C to 420°C, whereby each lamination group is protected from damage during handling. Grain-oriented, 3% silicon steel alloy is said to be preferred for the protective layer. Significantly, the Lin et al. patent teaches that each section in the core includes a plurality of butt-jointed laminations of high permeability material, with each lamination being a <u>closed</u> loop having a <u>single</u> butt joint. The assembly of the core around the coil is accomplished by sequentially fitting together the sections of the core beginning at the inside, thereby forming a single butt joint in each lamination in each group, as depicted in Fig. 1 of the Lin et al. patent. The patent further teaches that there is a problem of chipping the amorphous material, especially in fitting the step-lapped butt joints together. The use of an outer layer comprising a second, protective material

on the outside of each lamination group, and optionally on the inside as well, is said to mitigate this damage, notwithstanding the deleterious effect on core loss that the material is also said to have.

It is respectfully submitted that Lin et al. discloses an <u>unsegmented</u> core in which a single butt joint is formed for each lamination. That is, when the Lin et al. core is assembled, each lamination is closed such that the respective ends thereof are brought into abutting relationship. By way of contrast, applicants' amended claim 1 calls for a core having plural segments, in which no laminations are joined at their respective ends by a butt joint. This structural feature, taught by Lin et al., is clearly absent from the segmented core recited by claims 1 and 28. In view of the amendments to claims 1 and 28 and the foregoing remarks, it is submitted that applicants' claims are not anticipated by Lin et al.

Accordingly, reconsideration of the rejection of claims 1 and 28 under 35 U.S.C. 102(b) is respectfully requested.

Claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36 were rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 3,538,474 to Olsen in view of Lin et al.

Olsen discloses a C-type cut transformer core in which the laminations are arranged in a plurality of groups. The ends of adjacent laminations forming each group of the core are offset, the offset being substantially uniform except for predetermined pairs of adjacent laminations which are offset from three to ten times the uniform offset. The transformer core is assembled, e.g., with two C-shaped sections. It is suggested that the assembly is rendered difficult by the propensity of adjacent laminations to catch or snag each other as the sections are brought into mating relationship. The use of a smooth adhesive coating of a relatively low friction material and extension of the offset between adjacent laminations in preselected pairs of adjacent laminations are disclosed to address the deleterious effect of laminations catching or snagging during assembly. The patent further suggests the use of "grain oriented material" for the laminations.

As noted by the Examiner, Olsen does not disclose a transformer core comprising amorphous metals. In fact, amorphous metals were not even known to exist, and could not be made at the time the Olsen patent was applied for. With respect to claims 1 and 28 the Examiner has indicated that it would be obvious to use amorphous annealed metal for the strips of Olsen, as taught by Lin et al.

Applicants respectfully submit that the combination of Olsen and Lin et al. do not suggest to one having ordinary skill in the art the invention set forth in claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36, as amended. Rather, any transformer constructed in light of the combined teaching of Olsen and Lin et al. would differ in crucial respects from applicants' segmented transformer core and the segments comprised therein.

First, Olsen calls for a step-lap structure in which each lamination is offset from the lamination adjacent thereto, whereas applicants' claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36, as amended require that each group, comprising a plurality of laminations, be offset, but the individual laminations be aligned. It is important to recognize that cores suitable for transformers having ratings of 100 kVA or more must have builds at least several inches thick. Olsen's structure may be practical for constructing a core using the relatively robust laminations he discloses (grain oriented material at least a few thousandths of an inch thick). However, a structure requiring individual positioning of thousands of laminations of amorphous metal, each of which is less than a thousandth of an inch (i.e., less than 25 μm) thick needed to achieve the required build, would be highly impractical. Such a structure could not be readily achieved on a single-shot basis, let alone repeatedly during commercial production. The difficulty is greatly exacerbated by the brittleness of amorphous metal after annealing.

Recognizing the severity of the problems that attend handling of annealed amorphous metal, Lin et al. opts for a core in which an outer protective layer, and optionally an inner protective layer, of an alternative material are interspersed to separate lamination groups of amorphous metal.

Silicon steel, a grain oriented material like that used by Olsen, is said to be preferred. In this respect, the combination of Olsen and Lin et al. teaches away from applicants' invention, which does not require a protective layer. Moreover, as previously noted and recognized by Lin et al., such a protective layer would significantly increase core loss values. ... advan... Moreover, the Lin et al. structure is a wound core; not a segmented core, as required by applicants' amended claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36. As a result, the final construction of a transformer incorporating the Lin et al. core requires that the core first be formed and the laminations interlaced, then annealed, then unlaced for preformed coils to be slipped over the core limbs, and the core re-laced and finished. On the other hand, the segmented construction of the core called for by present claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36 eliminates the need for repeated lacing and unlacing operations, which are required during construction of the Lin et al. device. Clearly, these added steps complicate the manufacture of a Lin et al. core even when the cores have small sizes. They become virtually insurmountable for cores having the increased sizes called for by claim 36. Significantly, even though the Olsen core was disclosed in 1970 (more than 10 years before the filing date of the Lin et al. patent) no suggestion is contained in Lin et al. concerning a segmented core of the type disclosed by Olsen.

Olsen warns of the difficulty in assembling the C-sections of his core, noting the propensity of adjacent laminations to catch or snag each other as the sections are brought into mating relationship (col. 3, lines 26-35). On the other hand, Lin et al. disclose the likelihood of annealed amorphous metal chipping and breaking due to its thin gage and extreme brittleness in making a wound amorphous metal core (col. 1, lines 17-25). Taking the Olsen and Lin et al. teachings together would serve only to heighten their concern -- that using amorphous metal to construct an Olsen core would likely result in serious difficulties. It is therefore submitted that the skilled artisan would not have been motivated at the time of applicants' filing to combine the Olsen and Lin et al. disclosures. Even if the combination were to be made, the resultant transformer would still not

comprise homogeneous core segments. It is therefore submitted that the proposed combination of Olsen with Lin et al. cannot be properly made in the absence of applicants' own disclosure. Even then the proposed combination would require substantial reconstruction and redesign, which is not fairly taught by the references. On the other hand, the significant structural and operational advantages discussed hereinabove, which permit construction of significantly larger cores at lower cost in a more efficient and reliable manner, are achieved as the direct result of the elements delineated by amended claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36. It is only in light of applicants' own disclosure that these significant benefits are realized.

With respect to claim 4, the Examiner indicates that Olsen discloses a step-lap joint and a C-segment construction. As set forth above in connection with the rejection of claims 1 and 28 under 35 USC 102, the step-lap joint disclosed by Olsen differs from that of applicants' step-lap joint construction. The Olsen joint is indexed lamination by lamination, whereas applicants' joint is indexed group by group. Olsen simply lacks disclosure that would enable handling of amorphous metals, which are far thinner than any lamination materials Olsen contemplated. The practical difficulties encountered when assembling a core with ten or more times as many indexing steps are neither appreciated nor addressed by the Olsen teaching.

With respect to claim 7, the Examiner has noted Olsen's disclosure of the use of a smooth adherent material. It is significant that Olsen calls for the adherent material to be applied to the <u>ends</u> of the laminations (see col. 1, lines 63-65; col. 4, lines 66-70; and claims 7 and 11). The Olsen teaching states that the particular material chosen is not critical. Applicants' claim 7, on the other hand, calls for the <u>edges</u> of the laminations to be coated with a bonding material. The step lap region is specifically <u>excluded</u> and use of epoxy resin is specifically taught (page 6, line 1) as exemplary. Moreover, as shown by Figs. 5-9 and 11 of applicants' specification, the location of coating 51 does <u>not include the ends</u> of the laminations. Accordingly, applicants respectfully submit

that the Olsen teaching of coated ends points away from the invention recited by claims 7 and 32, wherein the edges, and not the ends, of the laminations are coated.

Regarding claim 14 the Examiner indicates that Olsen teaches a transformer core comprising two C-segments. Applicants respectfully submit, for the reasons set forth above in connection with claims 1 and 28, that Olsen, taken alone or in combination with Lin et al., fails to suggest a transformer core comprising a plurality of segments, each of which comprises a plurality of packets, the packets each comprising a pre-determined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern, each of the segments having been formed and annealed and the core having been assembled from said annealed segments. The further disclosure by Olsen of a particular geometrical feature of the core does not cure the basic deficiencies of the combined Olsen and Lin et al. patents. Further, applicants respectfully submit that the reasons supporting patentability of claim 14 over the combination of Olsen and Lin et al. are applicable as well to present claims 15-18 and 29-32, which are directed to cores and segments having various C, I, and straight segment structures.

With respect to claims 21-24 and 34-36, the Examiner has indicated that Olsen, as modified, discloses the instant claimed invention except for housing the core in an oil-filled or dry transformer, a distribution transformer, a power transformer, or used in a voltage conversion apparatus. Applicants respectfully submit, for the reasons set forth hereinabove, that the combination of Olsen and Lin et al. does not render obvious the invention recited by claim 1, as amended. Claims 21-24 and 34-36 depend from claim 1 and include all the limitations thereof. Accordingly, it is submitted that dependent claims 21-24 and 34-36 are not rendered obvious by any combination of Olsen and Lin et al.

In view of the amendment of claims 1 and 28 and the foregoing remarks, it is submitted that the present invention as recited by claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36, as amended, is patentably unobvious over Olsen and Lin et al. Accordingly, reconsideration of the rejection of

claims 1, 4, 7, 14-18, 21-24, 28-32, and 34-36 under 35 U.S.C. 103(a) as being obvious over the combination of Olsen and Lin et al. is respectfully requested.

Claim 20 stands rejected under 35 U.S.C. 103(a) over Olsen in view of Lin et al. and further in view of U. S. Patent 2,465,798 to Granfield.

Granfield discloses a magnetic core having a cruciform cross-section and comprising lamination layers of different magnetic materials, i.e., both hot and cold rolled steel materials. The laminations are disclosed to be joined at the <u>corner of each step or section</u> using an alternate butt and overlap joint or a miter joint. Granfield discloses that lower losses are obtained in a core wherein the hot rolled steel is concentrated in the outer laminations and the cold rolled steel is concentrated in the inner laminations than <u>vice versa</u>.

For the reasons previously set forth in connection with the rejection of claims 1 and 28 under 35 U.S.C. 103(a), applicants respectfully submit that the Olsen and Lin et al. teachings do not suggest the invention recited in amended claim 1. The Granfield disclosure, which predates the discovery of amorphous metal, does not cure this lack of disclosure by Olsen and Lin et al. Moreover, the core disclosed by Granfield clearly is a stacked core, in which an alternate butt and overlap joint or a miter joint is present at the <u>corner of each step or section</u>. The recitation of this structure <u>teaches away</u> from applicants' invention delineated by claim 20, which may incorporate C-segments or I-segments, each of which has a corner <u>without</u> a joint. Granfield also teaches away from the invention of claim 20, in that alternate butt and overlap joints and miter joints are disclosed, not the step-lap joint applicants require. Applicants thus respectfully submit that present claim 20 is patentable over any combination of Olsen, Lin et al., and Granfield.

Accordingly, reconsideration of the rejection of Claim 20 under 35 U.S.C. 103(a) as being obvious over Olsen in view of Lin et al. and further in view of Granfield is respectfully requested.

Claims 25 and 33 were rejected under 35 U.S.C. 103(a) over Olsen in view of Lin et al and further in view of U.S. Patent 4,450,206 to Ames et al. The Examiner has indicated that it would have been obvious to use the amorphous metal strip of Ames et al. in Olsen's unit as modified.

Ames et al. discloses an amorphous Fe-B-Si alloy having improved castability while maintaining good magnetic properties, ductility, and improved thermal stability. The alloy provided generally consists essentially of 6-10% B, 14-17% Si, 0.1-4% Cr, and the balance iron, with no more than incidental impurities. The Cr content is said to be "critical" (col. 4, line 41) and to improve the fluidity characteristics and amorphousness of the alloy, to unexpectedly improve the molten metal puddle control during the casting of the alloy, and to improve the corrosion resistance of the Fe-B-Si alloys.

In claims 25 and 33 applicants call for an alloy composition with an "M" component to be present in the range of 70-85 at.%, of which up to 10 at.% Ti, V, Cr, Mn, Cu, Zr, Nb, Mo, Ta and W may be replaced, a "Y" of 5-20 at.% that is at least one of B, C and P, and a "Z" component of 0-20 at.% of at least one of Si, Al and Ge. Applicants respectfully submit that the Ames et al. composition clearly sets forth different ranges of each of the constituents. For example, applicants alloy may contain 5-20% B and 0-20% Si, whereas Ames requires 6-10% and 14-17%, respectively. Ames et al. calls the presence of 0.1-4% Cr "critical," whereas presence of Cr in applicants' alloy is merely optional.

Moreover, Ames et al. does not disclose a segmented transformer core, let alone the particular core construction required by applicant's claims 1 and 28, from which claims 25 and 33 depend. In this respect Ames et al. fails to cure the deficiencies of the combination of Olsen and Lin et al. with respect to any of applicants' claims.

Accordingly, it is respectfully submitted that applicants' claims 25 and 33 are patentably unobvious over any combination of Olsen, Lin et al., and Ames et al. Reconsideration of the

rejection of claims 25 and 33 under 35 U.S.C. 103(a) being obvious over Olsen in view of Lin et al and further in view of Ames et al. is thus requested.

For the reasons set forth above, it is submitted that the invention delineated by present claims 1, 4, 7, 14-18, 20-25, and 28-39 patentably defines over any combination of Olsen, Lin et al. and Ames et al.

In view of the amendments to claims 1 and 28 and the remarks set forth above, it is submitted that the present application is in allowable condition. Reconsideration of the rejection of present claims 1, 4, 7, 14-18, 20-25, and 28-39, and allowance of this application, are therefore earnestly solicited.

Respectfully submitted,

D. Nathasingh et al.

By ____________

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Amended Claims - Clean Copy Without Markings

1. (Five times amended) A transformer core comprising a plurality of segments, each of which comprise of a plurality of packets, said packets each comprising a pre-determined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern, each of said segments having been formed and annealed and said core having been assembled from said annealed segments.

4. A transformer core according to claim 1 wherein at least one core segment has a C-segment, I-segment or straight segment construction.

7. A transformer core according to claim 1, wherein edges of each of said core segments are coated with a bonding material that protects said edges and imparts increased mechanical strength.

14. A transformer core according to claim 1, comprising two C segments.

15. A transformer core according to claim 14, comprising two C segments and an even number of straight segments.

16. A transformer core according to claim 1, comprising four C segments arranged to form a shell-type core.

17. A transformer core according to claim 1, comprising two C segments and one I segment arranged to form a shell-type core.

18. A transformer core according to claim 1, comprising two C segments, one I segment and an even number of straight segments arranged to form a three-leg transformer core.

20. A transformer core according to claim 1, wherein at least one core segment has a cruciform shaped cross-section.

25. A transformer core as recited by claim 1, wherein each of said amorphous metal strips has a composition according to the formula: $M_{70-85} Y_{5-20} Z_{0-20}$, subscripts in atom percent, where "M" is at least one of Fe, Ni and Co, "Y" is at least one of B, C and P, and "Z" is at least one of Si, Al and Ge; with the provisos that (i) up to 10 atom percent of component "M" can be replaced with at least one of the metallic species Ti, V, Cr, Mn, Cu, Zr, Nb, Mo, Ta and W, and (ii) up to 10 atom percent of components (Y + Z) can be replaced by at least one of the non-metallic species In, Sn, Sb and Pb.

28. (Amended) For use in a segmented transformer core, a transformer core segment comprising a plurality of packets, each of which comprises a pre-determined number of groups of cut amorphous metal strips arranged in a step-lap joint pattern, the segment having been formed and annealed and the segment being adapted by the presence of said pattern to be joined in a step-lap joint in said segmented transformer core.

29. An annealed transformer core segment according to claim 28 having a C-segment construction.

30. An annealed transformer core segment according to claim 28 having an I-segment construction.

31. An annealed transformer core segment according to claim 28 having a straight segment construction.

32. An annealed transformer core segment according to claim 28 further comprising a bonding material adhered to edges of said annealed transformer core segment.

33. An annealed transformer core segment according to claim 28 wherein each of the amorphous metal strips has a composition according to the formula: $M_{70-85} Y_{5-20} Z_{0-20}$, subscripts in atom percent, where "M" is at least one of Fe, Ni and Co, "Y" is at least one of B, C and P. and "Z" is at least one of Si, Al and Ge; with the provisos that (i) up to 10 atom percent of component "M" can be replaced with at least one of the metallic species Ti, V, Cr, Mn, Cu, Zr, Nb, Mo, Ta and W, and (ii) up to 10 atom percent f

components (Y + Z) can be replaced by at least one of the non-metallic species In, Sn, Sb and Pb.

34. A transformer comprising a transformer core according to claim 1.

35. An oil cooled transformer comprising a transformer core according to claim 1.

36. A transformer according to claim 34 having a duty rating of from 100 KVA to 500 MVA.

37. A process for the production of a transformer core from a plurality of individually annealed core segments which process comprises the steps of:

providing a plurality of metal strips,

stacking said amorphous metal strips to form a core segment comprising at least one packet which includes a plurality of groups of amorphous metal strips arranged in a step-lap joint pattern;

optionally forming said stacked amorphous metal strips to form a C-segment or an I-segment;

subsequently annealing said core segment;

subsequently assembling a transformer core by mating joints of at least two annealed core segments.

38. The process according to claim 37 wherein the core segment is annealed in the presence of a magnetic field.

39. The process according to claim 37 which includes the further process step of:

adhering a bonding material to edges of the annealed core segment.

20. A ... Version of Claims With Markings To Show Changes Made

cruciform shape ... cross-section.

~~6.~~ 1. (Five times amended) A transformer core comprising a plurality of ~~individually~~ 25. ~~transformer~~ segments, each of ~~said core segments comprising at least one packets which includes a plurality of groups~~ comprised of a plurality of packets, said packets, each packet including a predetermined number M groups of cut amorphous metal strips arranged in a ~~step-lap joint pattern~~ ... step-lap joint pattern, each of said segments having been formed and annealed and said core having been assembled from annealed segments. ... of components ... Sb and Pb

4. A transformer core according to claim 1 wherein at least one core segment has a C-28. segment, I-segment or straight segment construction.

~~An annealed transformer core segment...~~ ... with at least one further

~~7.~~ A transformer core according to claim 1, wherein edges of each of said core segments ~~are~~ coated with a bonding material that protects said edges and ~~imparts~~ ~~enhanced mechanical strength~~ ... of which comprises ... amorphous metal strips arranged in a step-lap ... segment having been

~~14.~~ A transformer core according to claim 1, comprising two C segments ... pattern to be ... ~~used in a step-lap joint in said segments~~ ...

15. A transformer core according to claim 14, comprising two C segments and an even 29. number of straight segments. ... having a C-segment construction.

16. A transformer core according to claim 1, comprising four C segments arranged to form a 30. shell-type core. ... according to claim 28 having an I segment construction.

17. A transformer core according to claim 1, comprising two C segments and one I segment 31. arranged to form a shell-type core. ... construction.

18. A transformer core according to claim 1, comprising two C segments, one I segment and an even number of straight segments arranged to form a three-leg transformer core.

bonding material adhered to edges of said ...

20. A transformer core according to claim 1, wherein at least one core segment has a cruciform shaped cross-section.

25. A transformer core as recited by claim 1, wherein each of said amorphous metal strips has a composition according to the formula $M_{70-85}Y_{5-20}Z_{0-20}$, subscripts in atom percent, where "M" is at least one of Fe, Ni and Co, "Y" is at least one of B, C and P, and "Z" is at least one of Si, Al and Ge; with the proviso that (i) up to 10 atom percent of component "M" can be replaced with at least one of the metallic species Ti, V, Cr, Mn, Cu, Zr, Nb, Mo, Ta and W, and (ii) up to 10 atom percent of components (Y + Z) can be replaced by at least one of the non-metallic species In, Sn, Sb and Pb.

28. (Amended) A transformer core comprising a transformer core segment according to claim 1. ~~An annealed transformer core segment adapted to be assembled with at least one further [illegible]~~ [illegible] transformer core, a transformer core segment comprising ~~at least one packet which includes a~~ plurality of packets, each of which comprises a [illegible] number of groups of cut amorphous metal strips arranged in a step-lap joint pattern, [illegible] having been formed [illegible] to be joined in a stepwise [illegible] core.

29. An annealed transformer core segment according to claim 28 having a C-segment construction.

30. An annealed transformer core segment according to claim 28 having an I-segment construction.

31. An annealed transformer core segment according to claim 28 having a straight segment construction.

32. An annealed transformer core segment according to claim 28 further comprising a bonding material adhered to edges of said annealed transformer core segment.

33. An annealed transformer core segment according to claim 28 wherein each of the amorphous metal strips has a composition according to the formula: $M_{70-85} Y_{5-20} Z_{0-20}$, subscripts in atom percent, where "M" is at least one of Fe, Ni and Co, "Y" is at least one of B, C and P. and "Z" is at least one of Si, Al and Ge; with the provisos that (i) up to 10 atom percent of component "M" can be replaced with at least one of the metallic species Ti, V, Cr, Mn, Cu, Zr, Nb, Mo, Ta and W, and (ii) up to 10 atom percent of components (Y + Z) can be replaced by at least one of the non-metallic species In, Sn, Sb and Pb.

34. A transformer comprising a transformer core according to claim 1.

35. An oil cooled transformer comprising a transformer core according to claim 1.

36. A transformer according to claim 34 having a duty rating of from 100 KVA to 500 MVA.

37. A process for the production of a transformer core from a plurality of individually annealed core segments which process comprises the steps of:

providing a plurality of metal strips,

stacking said amorphous metal strips to form a core segment comprising at least one packet which includes a plurality of groups of amorphous metal strips arranged in a step-lap joint pattern;

optionally forming said stacked amorphous metal strips to form a C-segment or an I-segment;

subsequently annealing said core segment;

subsequently assembling a transformer core by mating joints of at least two annealed core segments.

38. The process according to claim 37 wherein the core segment is annealed in the presence of a magnetic field.

39. The process according to claim 37 which includes the further process step f:

adhering a bonding material to edges of the annealed core segment.